

No. 772,435.

PATENTED OCT. 18, 1904.

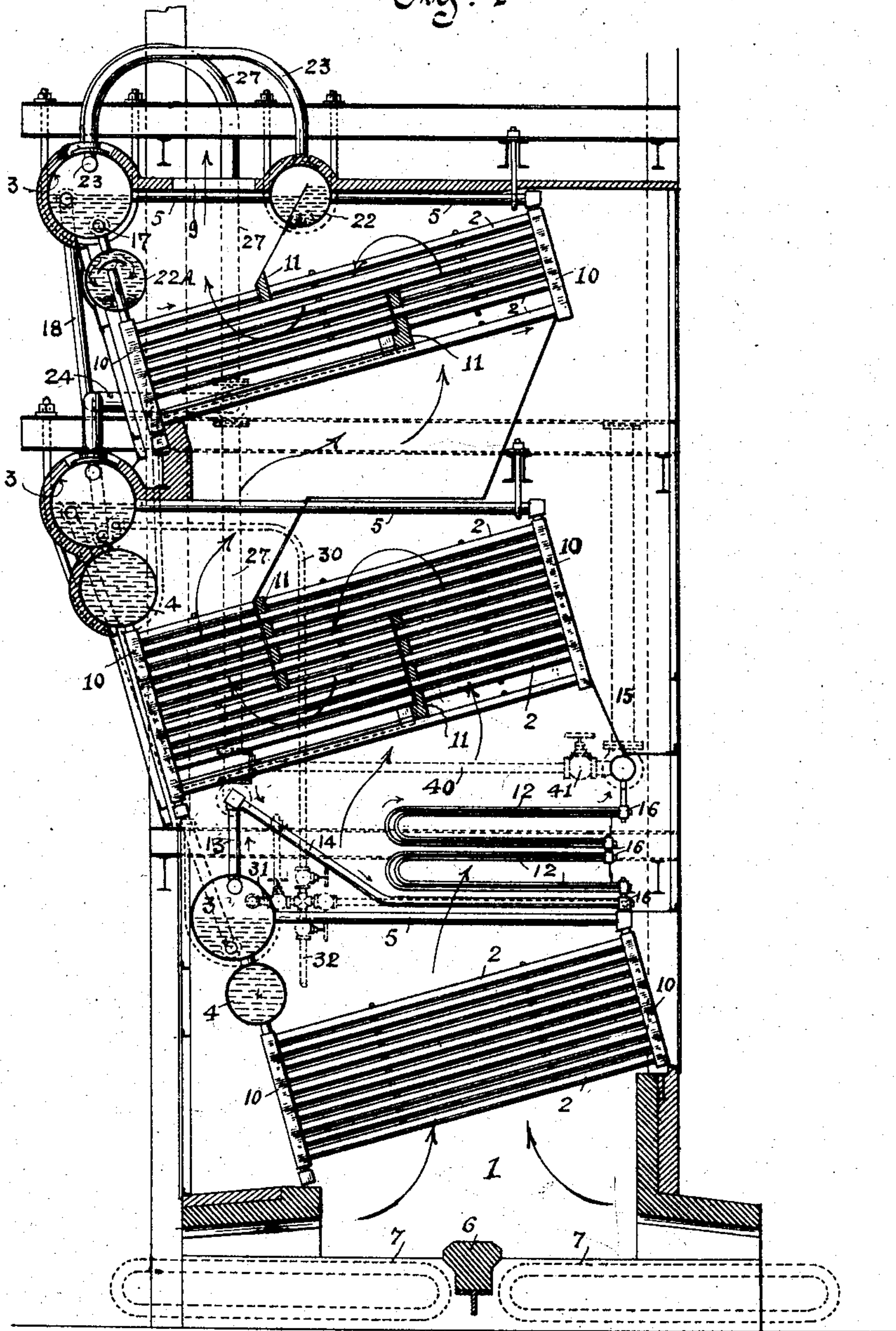
M. W. SEWALL.  
STEAM GENERATOR.

APPLICATION FILED JAN. 29, 1904.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses  
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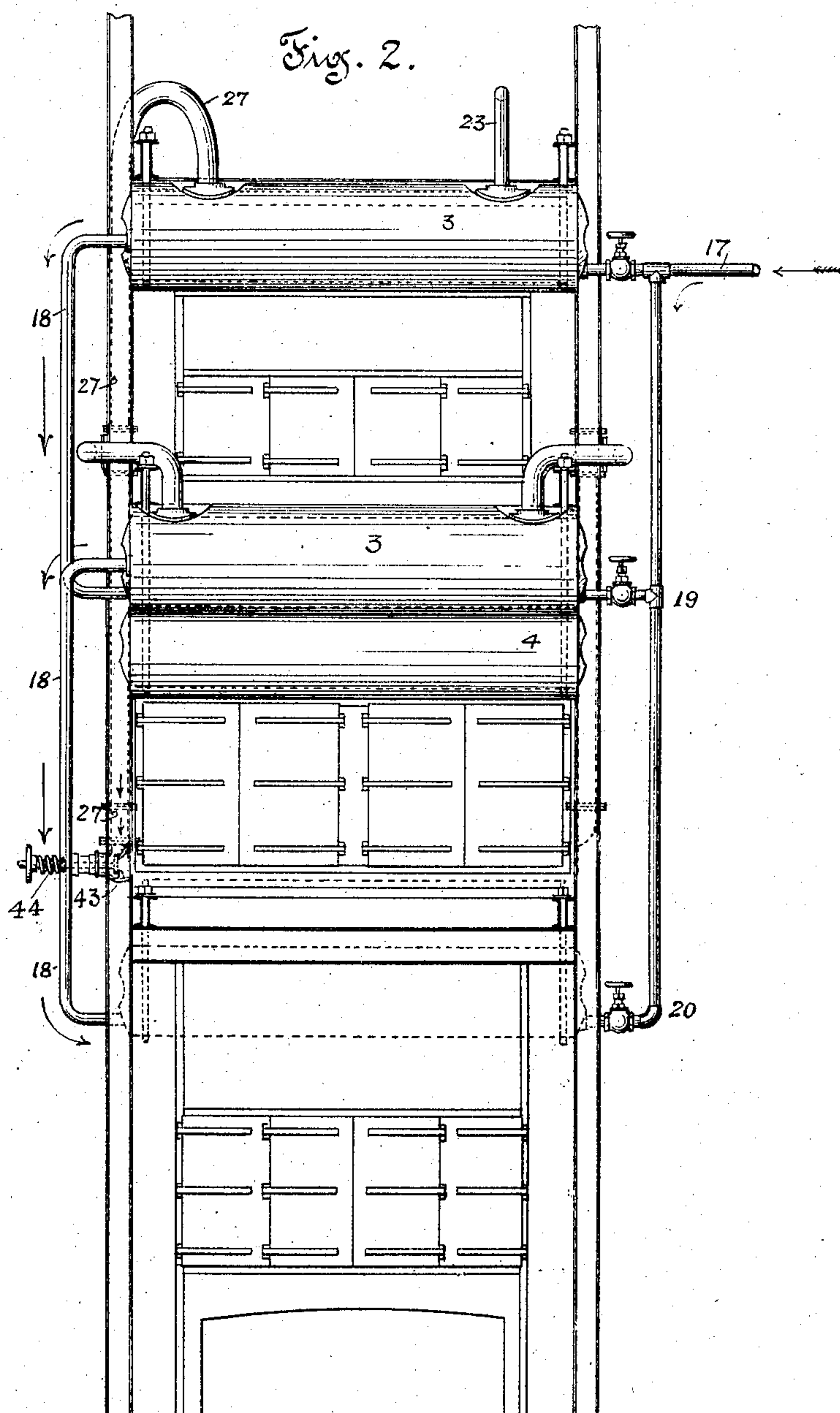
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# UNITED STATES PATENT OFFICE.

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## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 772,435, dated October 18, 1904.

Application filed January 29, 1904. Serial No. 191,128. (No model.)

*To all whom it may concern:*

Be it known that I, MINOTT W. SEWALL, a citizen of the United States, residing at Roselle, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention comprises a steam-generator plant erected within a given floor area or space in which a maximum amount of grate-surface is placed and above which in the path of the escaping products of combustion a corresponding amount of effective heating-surface is arranged in separate and complete superposed generators having a feed-water connection with the generator most remote from the furnace and therefrom with the other generators, whereby the temperature of the feed-water is raised by contact with the cooler products of combustion and primarily relieved of its impurities and then brought in contact with the higher temperature of the products of combustion enveloping the lower generators.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation, partly in section, and Fig. 2 a front elevation, of a structure in which the same number of parts in the same relative organization are shown.

The structure constituting the lower part of the respective figures consists of a water-tube steam-generator, preferably of the well-known Babcock & Wilcox type, comprising a furnace 1 at the base, an inclined group of water-tubes 2, located directly above the furnace, an elevated steam and water drum 3, and an intermediate water-drum 4, which communicate with the inclined group of water-tubes 2 through the connecting-nipples and circulating-tubes 5 in the usual way. The superposed generators constituting the upper part of the structure are made up of similar parts, which are designated by the same numerals of reference.

In the present structure the furnace-chamber extends the whole length of the longitudinal space occupied by the inclined group of water-tubes, and the corresponding grate-sur-

face is in this instance divided by a narrow central bridge 6, and the fuel is fed from both ends by means of an endless chain grate 7. (Indicated in dotted lines.) This type of grate is selected for the purpose of showing in the patent some kind of grate and fuel feed; but other well-known kinds of grate may be substituted, the requirements being that the grate extend substantially the full horizontal area occupied by the inclined group of the water-tubes. The supplemental inclined groups of water-tubes and steam and water drums located above the lower group are denominated the "upper" generators and made up of the same parts as the lower generator and are placed in the path of the products of combustion from the furnace to the exit or uptake opening 9, the course of the gases being indicated by the larger arrows in Fig. 1. The end headers 10 are placed at right angles to the inclined groups of water-tubes, and the respective construction and arrangement of the baffles or partitions 11 for directing the gases across the groups of tubes are well known and in common use in this class of generators.

In Fig. 1 a superheater 12 is shown located in the combustion-space intermediate of the two lower generators, which is connected with the steam-space of the steam and water drum 3 by the pipes 13 14 and with the steam-outlet pipe 15. The type of superheater shown is composed of a series of sections made up of bent tubes of U shape connected at their ends with cross-boxes 16, which communicate with the steam inlet and outlet connections. This type of superheater is also well known and in use, and other types may be substituted for it, if desired. Supplemental water-drums 4 are also shown in the lower generators for increasing the water volume, and drums 22 and 22<sup>A</sup> may also be introduced, as shown, in the upper generator for depositing a portion of the impurities precipitated by the rise of temperature of the feed in this particular generator.

The steam connections from the respective steam-drums are shown at 23, 24, and 13, which lead to the steam-supply pipe 27, the



pipes 14 directing the steam to the superheater 12, through which it is passed to the steam-exit 15.

In the superposed arrangement of the separate groups of inclined water-tubes shown the feed-water-supply connection is preferably made directly with the drum of the upper group of tubes, and the drums of the lower groups of tubes are fed from the upper drum by gravity after the feed-water has been raised to the temperature of the steam. The feed-water having been heated and freed from its impurities in the passage through the upper group of tubes is then carried to the most effective heating-surfaces.

A boiler is by the above means obtained which need be cleaned less frequently except in a comparatively small and accessible part.

The feed-water connection is shown at 17, Fig. 2, entering the steam and water drum of the upper group of tubes near its base and below its water line or level, and the feed-pipes which convey the feed to the lower drums are indicated at 18, the connections of these pipes 18 with the respective drums being at the water-level at the two upper drums and near the base of the drum in the lowest generator, whereby the feed is passed by overflow from the upper drums and enters the lower drum at the base or below its water-level, as shown in Fig. 1. To provide for a failure of the feed through the method just described, independent feed connections may be made from the main source of feed 17, as shown at 19 and 20 in Fig. 2.

The advantages attending the use of this invention are, first, it reduces the real estate or horizontal space required to a minimum; second, it provides a boiler plant that requires only a building of small cost to cover it, as all weights are carried on the foundations; third, it provides a steam-generating unit of the highest capacity at a lower cost than can be produced under existing practice if the cost of housing and single foundation are taken into account; fourth, the large amount of heating-surface inclosed by the small area of enveloping surface tends toward high efficiency; fifth, the separation into two or more parts provides for feeding the lower generator from the upper ones by gravity, thus feeding to the most effective heating-surface water that is freed from impurities by its passage through the upper generator; sixth, as a result of the preceding the water side of the lower generator will require cleaning much less frequently than if it received its feed at a temperature lower than that of evaporation; seventh, the lower generator in receiving its feed at the temperature of evaporation is more efficient than if it received it at a lower temperature; eighth, the arrangement of the heating-surface within the limited floor area permits the use of the usual standard of generator parts.

In other arrangements sufficient heating-surface could not be included in so small a floor area as to utilize effectively the heat developed on the large amount of grate-surface supplied without designing special parts of larger areas and in forms of less strength than those at present in use.

When the generator is first fired, steam is accumulated in the lower unit and prevented from passing directly to the upper units through the pipes 13 and 27 by a spring check-valve 43, placed in the pipe 27, as shown in Fig. 2. This check-valve opens outwardly, as shown, and its controlling-spring 44 is set to resist a nominal pressure, which forces the steam from the lower unit through the superheater and to the upper units through the pipe 40, the stop-valve 41 being open. The steam thus passing through the superheater will be sufficiently active to avoid the necessity of flooding it. In this preliminary operation of the generator the steam in contacting with the water in the upper units will be condensed and will consequently raise its temperature. When the upper units begin to generate steam, the check-valve 43 is opened and the stop-valve 41 closed. Then the steam from all the units passes through the superheater to the exit-pipe 15. Means, however, for flooding the superheater with water when the generator is first fired from one of the upper generators and discharging the same into a lower generator are shown in dotted lines in Fig. 1, consisting of the inlet-pipe 30, connected with the water-space of an upper generator and the superheater, an exit-pipe 31, communicating with the superheater and the steam-space in the lower generator, a discharge-pipe 32, leading to an external space, and stop-valves connected with the respective inlet and discharge pipes, as shown, for directing the water or steam to and from the superheater. The pipe 40 and valve 41 are also used to mix the saturated steam with the superheated steam, if desired. This pipe 40 communicates with the steam-pipe 27 and the steam-delivery pipe 15. (Indicated in dotted lines, Fig. 1.) The valve 41 may be operated by hand or by a thermostatic regulator.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A steam-generating plant comprising a series of separate and complete superposed units or generators located above a furnace-chamber having a feed-water supply connected with the higher generator and therefrom with the lower generators and steam-passages communicating with the respective steam-spaces of all the generators.

2. A steam-generating plant comprising separate and complete superposed units or generators, made up of standard parts having water and steam passages communicating with



the separate generators, and a grate-surface at the base in amount practically equal to the horizontal area occupied by said generators, whereby sufficient heating-surface is included to utilize effectively the heat developed on the increased amount of grate-surface, as set forth.

3. A steam-generating plant, comprising separate and complete superposed units or generators arranged within a given floor boundary; a grate-surface at the base practically equal to said floor area, a combustion-chamber enveloping said generators, and feed-water and steam connections communicating with the respective generators and steam-outlet, as set forth.

4. A steam-generating plant comprising a series of separate and complete superposed units or generators, located above a furnace-chamber having a feed-water supply connected with the higher generator, and therefrom to a lower generator, and a supplemental drum or chamber located in the water circulation of the higher generator for depositing impurities in the feed-water, as set forth.

5. A steam-generator comprising separate and complete superposed units or generators located above a furnace-chamber, and provided with water and steam passages communicating with each generator, and a super-

heater located above the lower unit in the path of the gases from the furnace and provided with connections with the upper units for flooding the superheater and connections for discharging the same to the lower unit, or to an exterior space, as set forth.

6. A steam-generator comprising separate superposed units or generators located above a furnace-chamber, and a superheater located above the lower unit having pipe and valve connections with the upper units to direct the steam accumulated in the lower unit when the generator is first fired, through the superheater to the upper units, as set forth.

7. A steam-generating plant comprising a series of separate and complete superposed units or generators located above a furnace-chamber having a feed-water supply connected with the higher generator and therefrom with the lower generators through water-drums communicating with each generator and steam-passages communicating with the respective steam-spaces of all the generators.

In testimony whereof I affix my signature in presence of two witnesses.

MINOTT W. SEWALL.

Witnesses:

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KATHARINE VAN VALKENBURG.